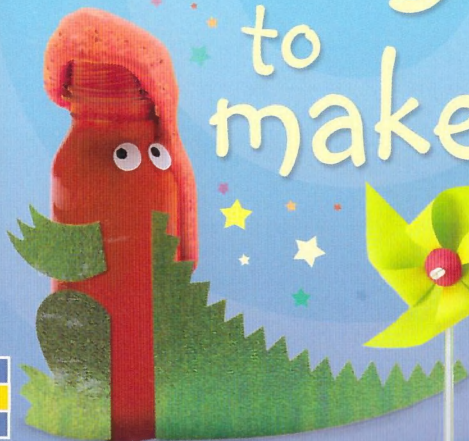
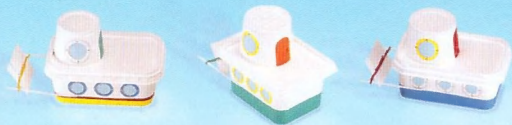




50 Science things to make & do

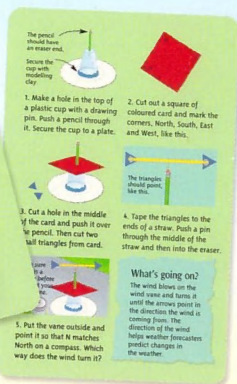




These activity cards combine fun things to do with scientific explanations.



Wind vane
Watch the weather change in this breezy activity.



The pencil should have an eraser end.
Secure the cup with modelling clay.

1. Make a hole in the top of a plastic cup with a drawing pin. Push a pencil through it. Secure the cup to a plate.

2. Cut out a square of coloured card and mark the corners, North, South, East and West, like this.

3. Cut a hole in the middle of the card and push it over the pencil. Then cut two tail triangles from card.

The triangles should point, like this.

4. Tape the triangles to the ends of a straw. Push a pin through the middle of the straw and then into the eraser.

5. Put the vane outside and point it so that N matches North on a compass. Which way does the wind turn it?

What's going on?

The wind blows on the wind vane and turns it until the arrows point in the direction the wind is coming from. The direction of the wind helps weather forecasters predict changes in the weather.

Just choose a card, then follow the simple instructions.

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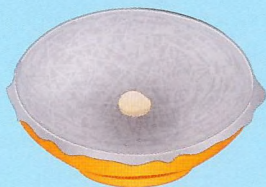


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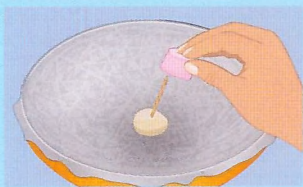
Cooking in the Sun

Choose a sunny day to discover
how you can trap the Sun's heat.





1. Line a large bowl with kitchen foil. Then press a piece of poster tack down in the middle of the bowl.



2. Put a marshmallow on the end of a cocktail stick. Push the other end of the cocktail stick into the poster tack.



3. Cover the top of the bowl with clear food wrap. Then put the bowl outside in a sunny place.



4. Use stones to prop up the bowl. Position it so that the inside is facing the Sun. Leave it for about 15 minutes.



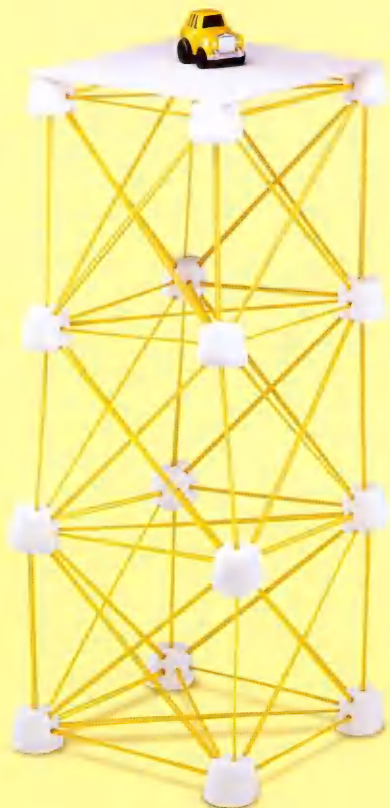
5. The marshmallow should start to melt. If it hasn't, leave it for another 15 minutes and check again.

What's going on?

The food wrap lets sunlight into the bowl and traps heat from the Sun. The foil reflects the light and heat around the bowl and onto the marshmallow. This heats it up. Because the air in the bowl is trapped, it gets even hotter, which also speeds up the cooking.

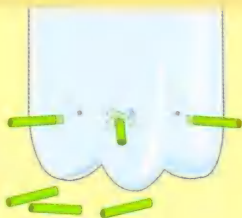
Stable structures

Find out which shapes make the strongest structures.





Use a pencil to widen the holes.



1. Cut the top off a large plastic bottle. Use a drawing pin and a pencil to make six holes around the base.

2. Cut a straw into six pieces about 2cm (1in) long. Push them into the holes and secure them with tape.

3. Make three holes at the top of the bottle and tie a piece of string through each hole. Then tie the strings to a fourth piece of string.



The strings should be about the same length.

4. Over the sink or outdoors, pour a jug of water into the bottle. As water pours out of the straws, the bottle will spin around.

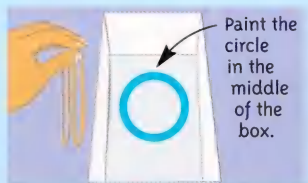


What's going on?

The energy from the water pouring out of the holes makes the bottle spin around. Falling water and its energy are used on a much larger scale at hydroelectric power stations. The water turns enormous wheels, called turbines. These drive machines called generators that produce electricity.

Elastic band guitar

Use elastic bands to make different musical notes.



1. Paint a circle in the bottom of a shoe box. Find two elastic bands the same lengths but different thicknesses.



2. Stretch them over the box and pluck each one with your finger. The thinner one makes a higher note.



Butterfly feeder



Attract butterflies into your garden with this feeder.



Make knots
at each end.

1. Make holes with a drawing pin on opposite sides of the rim of a plastic cup. Tie some string through the holes.



2. Make a hole in the bottom of the cup using a drawing pin. Push a ballpoint pen into the hole to widen it.

Paper planes

Find out how the shape of the wing can change a plane's direction.



1. Fold a piece of A4 paper in half so that the long sides meet. Open it out and fold the top corners to the crease.



2. Fold down the whole triangle shape you've just made, so that the tip lines up with the crease in the middle.



3. Then fold down the corners at the top so that they meet a little way above the tip of the triangle, like this.



4. Now fold up the tip of the triangle, so that it overlaps the folded-down flaps and holds them in place.



5. Turn the paper over. Then fold it in half down the middle crease and smooth out the creases.



6. To make wings, fold both sides down at the point shown here. Throw the plane to see how well it flies.



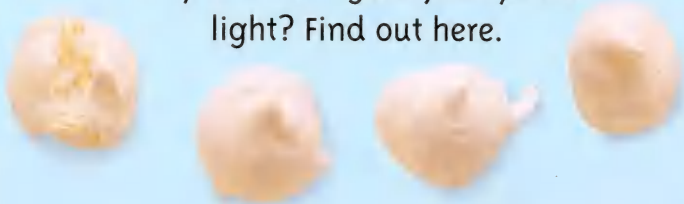
7. Curl the corner tips of the wings up or down around a pencil. How does this affect the plane's flight?

What's going on?

The fronts of the wings are thickest, which helps the plane to fly. Curling the wing tips changes the air flow. Curling up the left tip makes the plane steer to the left and vice versa. Curling up both tips makes the plane climb. Curling them down makes the plane dive.

Meringue science

Why are meringues foamy and light? Find out here.



1. Cut a piece of baking parchment to fit inside a baking tray. Heat the oven to 110°C (225°F, gas mark ¼).



2. Crack an egg on the edge of a bowl. Gently pull the shell apart and tip the white and yolk onto a saucer.

You won't need the yolk.



3. Hold a small cup over the yolk and tip the saucer so that the egg white dribbles into the bowl.

Use an electric whisk if you can; it's quicker!



4. Beat the egg white. After about 15 minutes, it forms a thick foam and the whisk makes peaks when you lift it.



5. Add 50g (2oz) of caster sugar, a teaspoonful at a time. Whisk the mixture after adding each spoonful.



6. Take a heaped teaspoon of the mixture and slide it onto the baking parchment using another teaspoon.



7. Do the same again, leaving gaps between each spoonful. Put the tray in the oven to bake for 45 minutes.



8. Turn off the oven and leave the meringues in for 15 more minutes. Then take them out and leave them to cool.

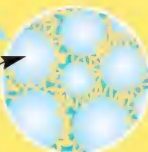
What's going on?

Egg white contains chains called albumin. Whisking whips air bubbles into the egg. The albumin traps the bubbles, making a foam. When you bake it, the foam hardens into meringues.



Before whisking, the albumin chains are quite tightly curled up.

Air bubble



After whisking, the chains uncurl and form a net that traps the air bubbles.

Making butter

Make your own butter and find out about the science behind it.



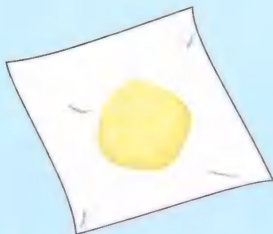


1. Half fill a clean jar with double cream. Add a pinch of salt for taste. Screw the lid on tightly and shake the jar.

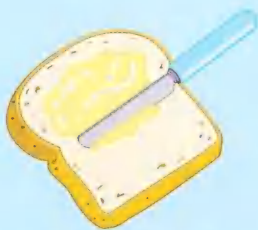
It's tiring, so you may want a friend to help you shake!



2. Shake the jar for about 10-15 minutes. Eventually, it will separate into a lump of fat and a milky liquid.



3. Take out the lump and put it on a paper towel. Wrap the towel around it and squeeze out any excess liquid.



4. Now taste it. The lump you have made is butter. Put it in a dish, keep it in the fridge, and spread it on some bread.

What's going on?

Cream is a mixture of tiny blobs of fat spread evenly through a milky liquid. When you shake the cream, the tiny blobs of fat bump into each other. The more you shake, the more they bump and join together. Eventually they turn into butter.

Fruity ice slush

Make your own delicious slush drink,
without a fridge!





1. Fill a mixing bowl with ice cubes. Sprinkle three tablespoons of salt on top of the ice cubes and stir it in.

Don't let salty ice get in the glass.



2. Carefully place a glass upright in the middle of the ice. Half fill the glass with fruit juice.

If it's a hot day, you may need to add more ice.



3. Stir the juice every 10 minutes with a spoon. After about an hour and a half, the juice will become slushy.



4. Stir it every 5 minutes for another half hour until it becomes slush. Then you can eat it or leave it to freeze solid.

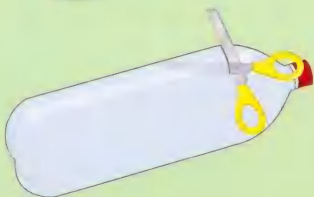
What's going on?

Adding salt makes the ice melt at a lower temperature. In the bowl you get very cold salty ice and water. This mixture absorbs heat from the fruit juice, making the juice colder and colder. Eventually it will freeze solid, but stirring it breaks up the ice, so that it forms a slush instead.



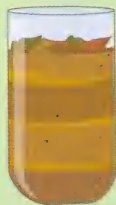
Make a wormery

See how worms' wriggling techniques mix up the soil and help plants grow.



1. Make a hole with a drawing pin at the top of a large plastic bottle. Then cut the top off, like this.

If you don't have sand, try to find different colours of soil.

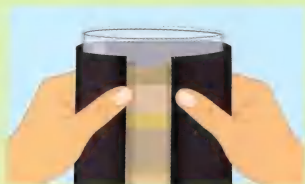


2. Fill the bottle with layers of soil and thinner layers of sand. Put dead leaves and four teaspoons of water on top.

You can often find worms under piles of dead leaves.



3. Dig around in some soil until you find two or three earthworms. Carefully put them into your bottle.



4. Cover the top of the bottle with food wrap and poke air holes in it with a pencil. Tape dark paper around the sides.



5. Add a couple of teaspoons of water each day, to keep the soil damp. After two weeks, take the paper off.



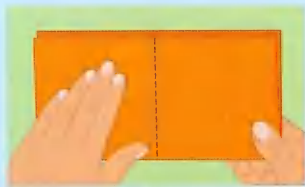
6. The worms will have mixed up the soil and made tunnels. Now return the worms to their original home.

What's going on?

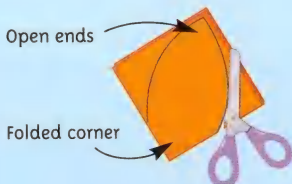
Worms mix everything up as they make their burrows. The different-coloured layers of soil and sand make it easier for you to see how they do this. It's great for gardens, as the mixing adds air to the soil and the burrows make channels for water. The worms may have pulled the dead leaves down to eat. This mixes nutrients into the soil. All this helps plants get everything they need from the soil to grow healthily.

Floating flowers

Float these flowers in water and watch what happens.



1. Cut out a square of paper about 15cm x 15cm (6in x 6in). Fold it in half one way and then in half again.



2. Draw a petal shape outwards from the folded corner. Cut around the shape to make the petals.

You should be able to see the seeds through the jars.



3. Drain the seeds. Push the beans down the sides of one jar, and the lemon seeds down the sides of the other.



4. Put the jars in a warm, dark cupboard. Check them each day and add water, if needed, to keep them wet.

The beans should sprout after a few days. The lemon seeds will take longer.



5. Once the beans and seeds sprout, move the jars to a light place, such as a windowsill. Keep them wet.

The new pots give the plants space to grow.



6. They will grow roots. After a week or two, plant them, root down, in small pots of soil, and water regularly.

What's going on?

Putting the seeds in a dark cupboard encourages them to seek light and sprout. Once they've sprouted, light and water are essential for them to grow successfully. Beans and chickpeas sprout quickly. Most bean plants will grow and die in a year. Lemon trees live and grow for years, but their seeds may take several weeks before they sprout.

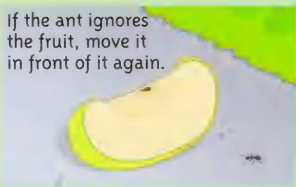
Team trail

See how ants can organise
some clever teamwork.





1. First you need some ants. You may have to wait until the summer to find them on paths around your home.



If the ant ignores the fruit, move it in front of it again.

2. When you have found an ant, put a thin slice of fruit in front of it. It may eat some of it or carry bits away.



One ant may attract more ants, until they make a trail.

3. Check the fruit after an hour. Have other ants been attracted to it? If so, what are they doing?



4. When there are lots of ants, move the fruit to a new position, a little to the side. What do the ants do?

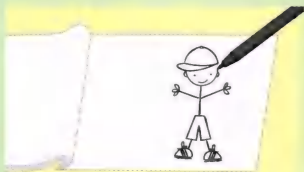
What's going on?

You can see one of the best examples of insect teamwork by watching ants. If one ant finds food, it leads others there to eat it too. They follow each other by making long trails. The ants go back and forth collecting food, to take back to their nest. When you move the fruit, the ants will still find it. But, instead of making a new direct route to the food, they will follow each other via their old trail route.

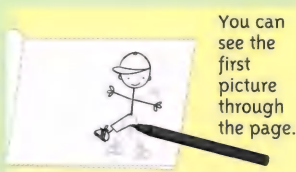
Flick book

Try this eye-catching activity to
see how movies are made.



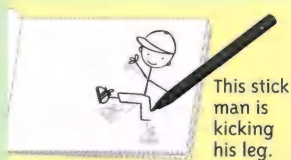


1. You need a small pad of paper, thin enough to see through for tracing. Draw a stick man on the last page.



You can see the first picture through the page.

2. Turn to the second to last page. Trace the outline of the man, but slightly change the position of an arm or leg.



This stick man is kicking his leg.



3. Keep tracing the picture from the page below, but make small changes each time as if the man has moved.

4. Draw at least 20 pictures like this. Flick through them from back to front. Your stick man will appear to move.

What's going on?

As you flick the pages, your eyes and brain try to blend the pictures together, so the stick man seems to move. Movies need to show 24 pictures every second to make the image smooth enough to look as if it's really moving.



In movies, the pictures are joined together in a long strip, so that they can quickly pass through the projector.



Bottle flute

Find out how blowing into bottles
can make musical notes.





1. Pour different amounts of water into a selection of glass bottles. Don't fill any to the top.



2. Rest the neck of one bottle on your lower lip. Blow gently across the top until you hear a note.

If you can't get a note, change the angle, or how hard you blow.



3. Blow gently across all the bottles in turn. Do different levels of water make different notes?



4. You could add food dye to the water, so that you can see the levels more easily.

What's going on?

Blowing makes the air inside the bottle vibrate, producing a note. The notes change according to the amount of water and air in the bottle. The bigger the space between the water and the top of the bottle, the lower the note.

Surface tension

Create beautiful patterns while experimenting with surface tension.





1. Half fill a small bowl with water. Then sprinkle a thin layer of ground pepper on the surface.



2. Dip a cocktail stick in washing-up liquid. Then touch the middle of the water with the stick's tip.



3. As the washing-up liquid touches the water, watch the grains of pepper. What happens to them?



Use several colours of food dye if you have them.

4. Half fill another small bowl with milk. Then add two or three drops of food dye in different places.

You can touch the milk in several places to make the dyes blend more.



5. Dip a cocktail stick in washing-up liquid and touch the milk with it. What happens to the dyes as you do this?

What's going on?

Washing-up liquid reduces surface tension. This allows the particles of water at the surface to spread out more. As they spread out, they push the pepper specks or the food dyes, so that they spread out and merge together, creating patterns.

Hanging crystals

Watch these amazing crystals
grow on a piece of wool.



Be careful when pouring
very hot water.

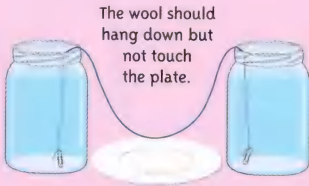


When a layer forms at the bottom, it means no more will dissolve.



1. Fill two jars with hot water. Stir in about six teaspoons of bicarbonate of soda, until no more will dissolve.

2. Put the jars in a warm place where they won't get moved, with a small plate in between them.



The wool should hang down but not touch the plate.



3. Cut a piece of wool as long as your arm. Tie a paperclip to each end of it and place one end in each jar.

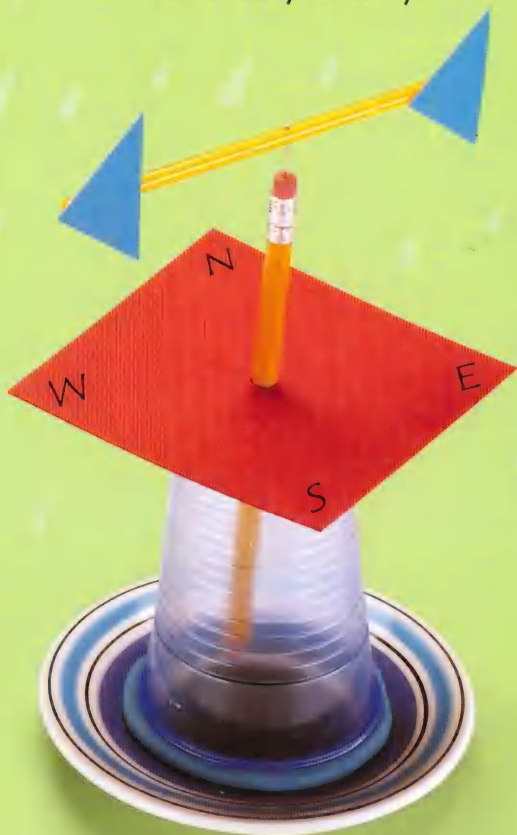
4. Leave the jars for a week. Crystals will grow along the wool and hang down over the plate.

What's going on?

The wool soaks up the mixture. When the water evaporates, all that's left are bicarbonate of soda crystals. The hanging crystals are formed when the mixture starts to drip from the wool and evaporate. If you're lucky, you might even get crystals that drip onto the plate and form columns.

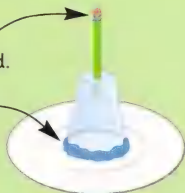
Wind vane

Watch the weather change with
this breezy activity.

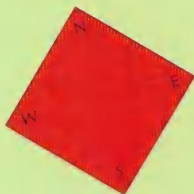


The pencil should have an eraser end.

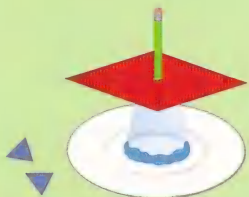
Secure the cup with modelling clay.



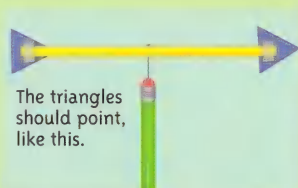
1. Make a hole in the top of a plastic cup with a drawing pin. Push a pencil through it. Secure the cup to a plate.



2. Cut out a square of coloured card and mark the corners, North, South, East and West, like this.

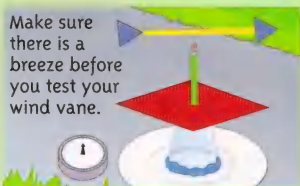


3. Cut a hole in the middle of the card and push it over the pencil. Then cut two small triangles from card.



4. Tape the triangles to the ends of a straw. Push a pin through the middle of the straw and then into the eraser.

Make sure there is a breeze before you test your wind vane.



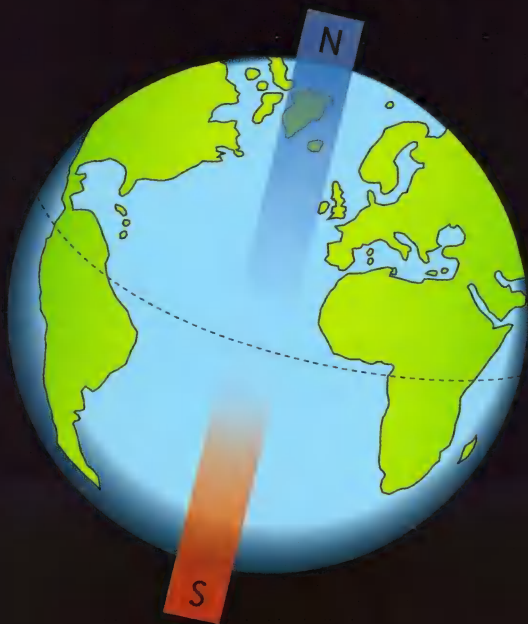
5. Put the vane outside and point it so that N matches North on a compass. Which way does the wind turn it?

What's going on?

The wind blows on the wind vane and turns it until the arrows point in the direction the wind is coming from. The direction of the wind helps weather forecasters predict changes in the weather.

Paper compass

The Earth contains iron. Explore how this affects magnetism.

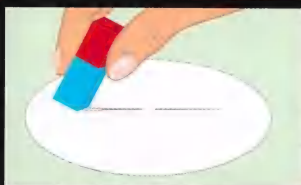


Special equipment

You can buy strong magnets from toy or hardware stores. Don't use fridge magnets, as they're too weak.



1. Draw around a glass on a piece of thin paper. Cut out the circle. Then thread a big needle through it, like this.



2. Stroke the needle 20 times in the same direction with one end of a magnet. Lift the magnet between strokes.

Be patient; it may take a moment before it moves.



3. Fill a bowl with water and float the paper on top. After a moment, it will slowly spin around and then stop.

You can check this with a real compass.



4. If you turn the paper now, the needle will still spin back to point the same way. It will be facing north-south.

What's going on?

A needle is made of steel, which contains particles of iron, jumbled up. But when you stroke a needle with a magnet, the iron particles become temporarily magnetized. Inside the Earth there is so much iron that it acts like a giant magnet, giving the Earth a magnetic field. The magnetized needle lines up with the Earth's magnetic field. This makes it act like a compass, so it always turns to point north-south.



Jumbled iron particles in a needle



Ordered iron particles in a magnetized needle

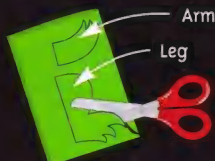
Foaming monster



Watch a chemical reaction when you make this foaming monster.

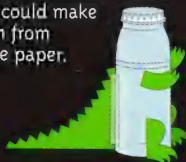


1. Get a piece of thick paper, half the height of a small plastic bottle. Draw a monster's tail and cut it out.



2. Fold another piece of paper in half. Draw an arm and a leg. Cut them out through both layers of paper.

You could make teeth from white paper.



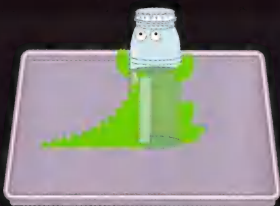
3. Tape the tail to one side of the bottle. On the other side, tape the legs to the bottom and the arms above them.



4. Cut out two small circles from white paper. Draw a dot on each one. Glue them above the tail to make eyes.



5. Half fill the bottle with vinegar. Add a good squirt of washing-up liquid and a drop of food dye.



6. Gently swirl the bottle to mix the contents. Then place it in the middle of a large baking tray or dish.



7. Put a heaped teaspoon of bicarbonate of soda in the middle of a square of tissue. Roll it up and twist the ends.



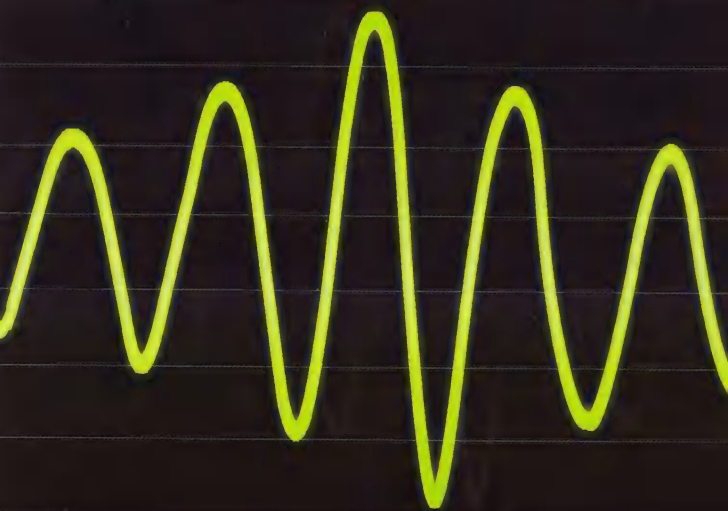
8. Drop the tissue into the bottle. After a couple of minutes, foam will come out of the monster's mouth.

What's going on?

When you mix vinegar and bicarbonate of soda, it makes a gas called carbon dioxide. This forms bubbles in the vinegar. The bubbles of gas react with the washing-up liquid to make foam. The whole combination reacts so much that foam pours out of the monster's mouth.

Quacking duck vibrations

Experiment with vibrations to make
a strangely familiar sound.





1. Make a hole in the bottom of a plastic cup using a drawing pin. Push a pencil into the hole to widen it.



2. Cut a piece of string that is about as long as your arm. Then make a couple of knots in one end of the string.



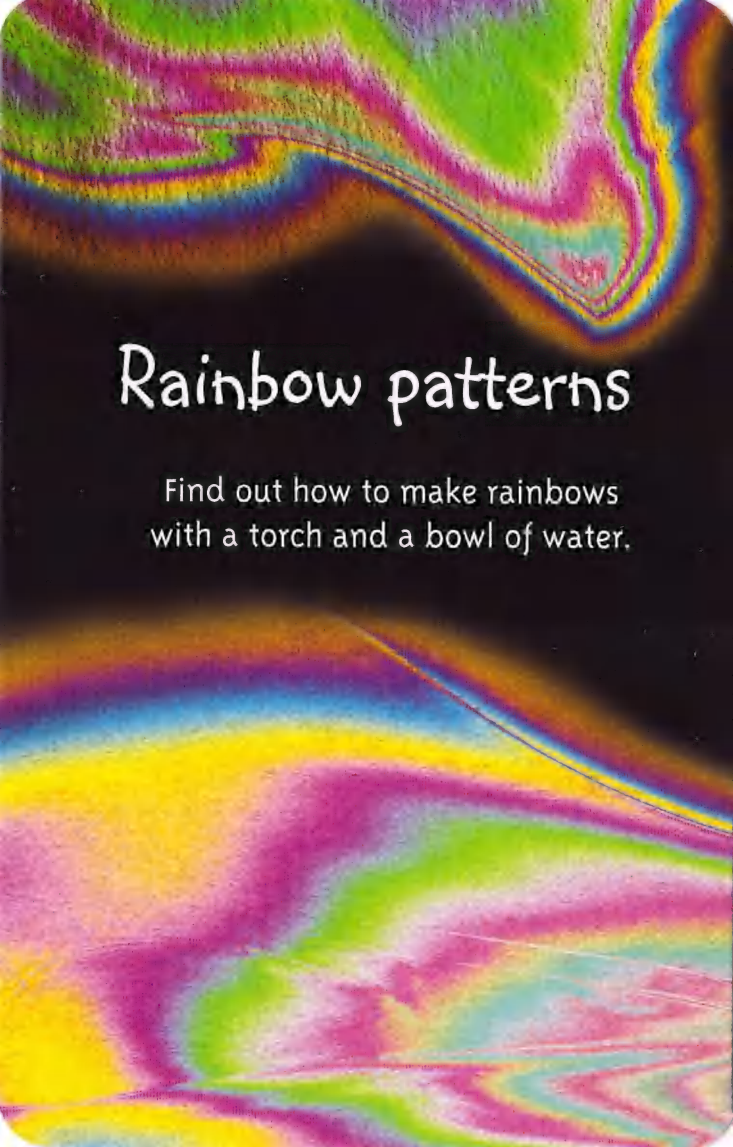
3. Thread the string through the hole, so that the knots rest on the outside of the bottom of the cup, like this.

4. Wet a paper towel. Hold the cup in one hand and drag the wet towel down the string with the other. What happens?



What's going on?

As you drag the wet paper towel along the string, it makes the string vibrate. The vibrating string makes the cup vibrate too, which makes the sound louder. The vibrations are uneven, so they make an unmusical sound rather like a quacking duck.

The image features two distinct rainbow patterns created in water. The top pattern is a complex, swirling shape with a mix of green, purple, blue, and yellow, set against a black background. The bottom pattern is a more elongated, horizontal rainbow with a clear spectrum of colors from red to violet, also on a black background. The text is centered between these two patterns.

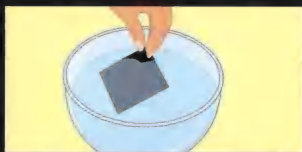
Rainbow patterns

Find out how to make rainbows
with a torch and a bowl of water.

Make rainbow paper



1. Half fill a bowl with water. Add one drop of clear nail varnish to the surface of the water. It will spread out.



2. Dip a small piece of black paper into the water and lift it out. Let it dry. If you tilt the paper you will see rainbows.

Rainbow reflected

You may need to prop up the mirror with a small stone to keep it in place.



1. Fill a tub with water. Lean a small mirror at an angle at one end. Shine a torch onto the underwater part of the mirror.



2. Then hold a sheet of paper a little way behind the torch. Move it around until you can see a rainbow on the paper.

What's going on?

In the first activity, the varnish forms a thin layer on the water. When the varnish is transferred to the paper and light shines on it, the light is reflected by the layers of varnish. This creates rainbow patterns.

In the second activity, when a beam of light passes through water, the water makes the light bend. The different colours in light bend by different amounts, which makes them separate, making a rainbow. The mirror reflects the rainbow onto the paper.

Sinking diver

Watch air under pressure in this activity.



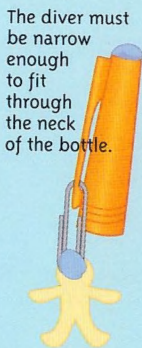
1. Find a piece of paper that will fit halfway round a big plastic bottle. Draw an underwater scene on it and tape it around the bottle, so you can see it from the front.



2. Find a pen lid with a pocket clip, and attach a paperclip, like this. If there is a hole in the top of the lid, block it with a little poster tack.



3. Cut out a diver shape from thin, coloured plastic. Then press the diver on to the paperclip with poster tack.



5. Fill the bottle with water. Then carefully lower the diver through the neck and screw the lid on.



4. Put the diver in a tall glass of water. The model should float near the top. If it's too heavy and sinks, remove some of the poster tack.



6. Squeeze the sides of the bottle and the diver will sink. Then let go, and the diver will float up to the surface again.

The diver will move slowly at first, so watch carefully.



What's going on?

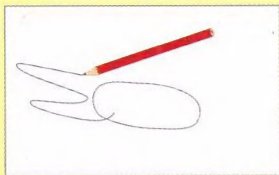
An air bubble is trapped in the pen top when you drop the diver in. Squeezing the bottle pushes water up the top which squashes the air bubble and lets water in, making the diver sink. When you stop squeezing, the air bubble returns to normal size, pushing the water out. So the diver floats again.

Shadow show

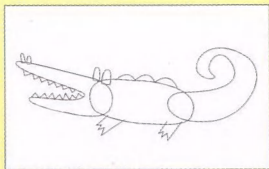
Perform a show for your friends, using light and shadows.



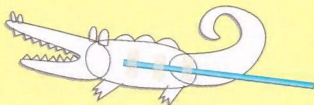
1. Paint some tree trunks and leaves on a big piece of white paper. Add some grass and flowers at the bottom.



2. To make a crocodile puppet, draw a body shape on a piece of cardboard. Then add jaws and a tail.



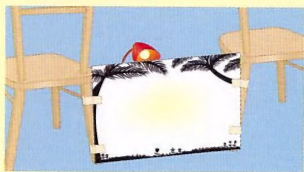
3. Draw bumps for eyes and nostrils, and a few bumps along its back. Add some sharp teeth and legs.



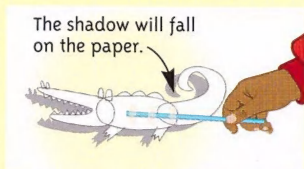
4. Cut around it. Tape a straw to its body, like this. You can make other animal puppets in the same way.



5. Use masking tape to attach the screen between two chairs, with the painted side facing the front.



6. Darken the room. Put a lamp behind the chairs. Switch on the lamp and shine it on the screen.



7. Sit behind the chairs and the screen. Hold your puppet by the straw, so that it's nearly touching the paper.



8. Move your puppet to make it perform. The audience will see the puppet's shadow on the screen.

What's going on?

Light from the lamp passes through the unpainted areas of the screen. But the puppet blocks the light, casting a shadow onto the screen.

The audience can see the shadow from this side.

